

# **TECHNICAL SUPPORT DOCUMENT**

# PROPOSED UNDERGROUND STORAGE TANK (UST) RELEASE CASE CLOSURE EVALUATION SUMMARY

LUST Case File #: 0322.01 Facility ID # 0-002770 Cochise County

Giant #900 (Speedway Store #2988) 201 North Haskell Avenue Willcox, Arizona 85643

#### Background:

The former underground storage tanks (USTs) were removed in 1987 and included three 5,000-to 8,000-gallon gasoline tanks. Leaking UST (LUST) #322.01 was confirmed in July, 1987. The UST owner/operator was Kaibab Industries. In 1988 and 1991, Groundwater Technology, Inc. (GTI) conducted site characterization activities at the Site. GTI installed a total of six groundwater monitoring wells (KW-1 through KW-6) onsite and offsite. Since 1996, ADEQ's State Lead program has been performing investigations and corrective actions at several LUST sites located in the City of Willcox, including downgradient LUST #4552.01, a Shell Service Station. In February 1996, EMCON conducted additional groundwater characterization activities at the Site and surrounding areas. In December 1998, Environmental Science and Engineering, Inc. (ESE) installed groundwater monitoring wells KW-7 through KW-9.

A Site Characterization Report was approved October 15, 2010. Numerous groundwater monitoring and remediation wells have been installed within and near the Site. Monitoring of these wells determined that groundwater currently occurs at a depth of approximately 33 feet below ground surface (bgs) and flows to the north, northwest. Several of the groundwater wells within and near the Site have historically contained free product and were impacted by dissolved-phase hydrocarbon contamination. Currently the Site is an active gas station and convenience store operating with three 10,000-gallon fiberglass USTs.

#### Removal or control of the source of contamination:

The former USTs were removed in 1987. In December 1998, ESE installed a thermal oxidizer soil vapor extraction (SVE) system. By December 1999, the SVE system had operated for a total of 4,208 hours and removed an estimated total 37,434 pounds of volatile fuel hydrocarbons, representing approximately 5,759 gallons of gasoline. In March 2002, the SVE system was shut down after rebound testing showed that continuing SVE was no longer a cost-effective remediation strategy. According to ADEQ records, a total of 18,805 gallons of free product have been removed from the Site through the collective use of SVE, free product recovery and enhanced free product recovery methods. During the April 2021 groundwater sampling event, well KW-3 was the only well containing free product (thickness of 0.3-feet).



#### Characterization of the groundwater plume:

Nine wells (KW-1 through KW-9) have been installed at the Site to characterize groundwater conditions. Based on the most recent groundwater monitoring event (April 2021), groundwater flows toward the north at a depth of approximately 33 feet bgs with a gradient of approximately 0.00059 feet/foot. Monitoring well KW-3 is considered the center (source area) of the plume, well KW-5 is located upgradient, and well KW-8 is a downgradient well. Samples collected on April 14, 2021 reported wells KW-3 and KW-4 with volatile organic compounds (VOC) concentrations in exceedance of Aquifer Water Quality Standards (AWQS). The sample from KW-3 reported benzene as non-detect (<9.41 $\mu$ g/L), although the laboratory detection limit was above AWQS due to dilution. The sample from KW-4 reported benzene at a concentration of 2.28  $\mu$ g/L, which was flagged as an estimate because the reporting limit was elevated due to dilution. Additionally, well KW-3 reported 1,2-dichloroethane (1,2-DCA) at a concentration of <8.19  $\mu$ g/L, again due to dilution. The September 2019 sample at KW-3 reported 1,2-DCA at a concentration of 6.19  $\mu$ g/L. Wells KW-3 and KW-4 are the only wells with current VOC concentrations exceeding Arizona AWQS.

#### *Groundwater plume stability:*

Groundwater sampling results from the most recent sampling event (April 2021) report that wells KW-3 and KW-4 are the only wells with VOC exceedances of the AWQS. Benzene was reported at concentrations of <9.41  $\mu$ g/L and 2.28  $\mu$ g/L at KW-3 and KW-4, respectively. 1,2-DCA was reported at a concentration of <8.19  $\mu$ g/L at KW-3 and 3.4  $\mu$ g/L at KW-4. Wells KW-5, KW-7, KW-8, and KW-9 went dry sometime between 2006 and 2010 and never recovered. Insufficient recent data is available to apply a Mann-Kendall trend analysis, although surrounding wells report VOCs below the AWQS. Historical sample data from 1991 and 2002 reports VOC concentrations at well KW-3 with benzene at 7,500  $\mu$ g/L and 2,600  $\mu$ g/L, respectively. The data at KW-4 reports benzene and 12,000  $\mu$ g/L and 2,700  $\mu$ g/L in 1996 and 2001, respectively. The current sample data supports that the plume has undergone a substantial decrease in VOC concentrations over time. This condition supports that the groundwater plume is stable and/or decreasing.

#### Natural Attenuation:

There are several factors that control the reduction of contaminant concentration levels seen in the monitor wells. Monitored natural attenuation parameters were sampled on December 17, 2019 and April 14, 2021 and report the following:

- Nitrate concentrations on the eastern side of the remediated plume are high (22.8 milligrams per liter [mg/L]) and nitrate concentrations within the remediated plume area are low (<0.206 mg/L);
- Ferrous iron is present at the Site with highest concentrations to the west (KW-4 at 9.54 mg/L) and lowest concentrations to the east (KW-1 at <0.150 mg/L);
- Sulfate is present at the Site with highest concentrations to the east (KW-1 at 189 mg/L) and lowest concentrations to the in the source area (KW-3 at 10.8 mg/L);
- Methane is only present in limited concentrations in the western most wells (KW-4 at 1.08 mg/L and KW-3 at 0.415 mg/L), indicating a strongly reduced environment remains in the source area. Methane was not detected in the remaining Site-associated wells.

Additionally, dissolved oxygen (DO) concentrations collected during the April 2021 monitoring



event report concentrations within the remediated plume are low (<2.0 mg/L) and DO concentrations outside/downgradient of the remediated plume are greater (>3 mg/L). The low concentrations of nitrate in the source area indicate depletion of nitrate as an electron acceptor. However, significantly elevated nitrate remains in upgradient groundwater. The presence of methane, dissolution of iron (i.e., ferric to ferrous iron) and the low DO (<2 mg/L) in the source area indicates that biodegradation and natural attenuation of VOCs is occurring. Brown and Caldwell incorporated the BIOSCREEN model for evaluating benzene using the most recent VOC data from KW-3. Since the data support the process of biodegradation, the instantaneous reaction model was employed. The model was conducted assuming a 100 kg soluble mass to mimic a continuous source. Based on this, the model predicts benzene will degrade below AWQS within 20 feet of the source. Running the model with a lesser soluble mass (10 kg) predicts benzene will degrade below AWQS at the source well within 5 years. The BIOSCREEN model was also incorporated to evaluate 1,2-DCA using the most recent VOC data from KW-3. The 1st-order decay method was used to evaluate 1,2-DCA degradation. The model predicts that even with a very large soluble mass of 1,2-DCA (10 kg), the concentration will degrade below AWQS within 20 feet of the source.

#### *Threatened or impacted drinking water wells:*

A search of the Arizona Department of Water Resources' (ADWR's) well registry database reported 138 wells within a ½-mile radius of the site. Of the 138 wells, 31 are exempt, 93 are monitoring wells, one is a non-exempt well, and 13 are listed as other. According to the ADWR database, the closest downgradient well (#55-643226) with drinking water listed as a use is located approximately 450 feet north of the Site, however, ADWR states the well is capped. Additionally, domestic water is provided by the City of Willcox (PWS # 02-035). The ADWR database reports a City of Willcox owned well (55-606267) as being located northeast of the Site, but a review of the data and reference to Google Maps suggest that the well is actually located outside the ½-mile survey area, west of the Willcox Unified School District offices (480 N. Bisbee Ave.). According to the ADEQ Safe Drinking Water Database, the City of Willcox has been historically non-detect for all VOC constituents.

#### *Other exposure pathways:*

The property is being used as an operating gas station and has been entirely paved with concrete. Soil samples were collected by others during the initial monitoring well installations (December 1998). Pathways for exposure to contaminated soil via ingestion and direct contact are incomplete due to any remaining soil contamination being capped by concrete and pavement.

Brown & Caldwell conducted two soil vapor surveys at the Site including 7 total sample locations. During the first event (May 7, 2020), three samples were collected (SVS-1 thru SVS-3). Analytical results for sample SVS-3 reported multiple hexane associated compounds at concentrations much greater than samples SVS-1 and SVS-2. A suspected release #6219 was opened in May 2020 based on the results of SVS-3. To investigate the suspected release, Stantec (working for Speedway the current UST owner/operator), drilled vertical boring B1 and angle boring B2 (20-degrees from vertical) to 6 feet bgs on August 24-25, 2020. Boring B1, located east of the UST basin, was cleared without encountering an obstruction. The proposed location for boring B2, north of the UST basin, encountered a black PVC pipe at approximately 3 feet bgs. Boring B2 was relocated to avoid the pipe as indicated on the site map. Boring B1 and angle boring B2 were drilled to a vertical depth of 28 feet bgs using hollow stem auger drilling methods. Soil samples were collected from each boring at 5-foot intervals at vertical depths from 5 feet bgs to 28 feet bgs. Laboratory analytical results of the samples collected from boring B1



were below the ADEQ Residential Soil Remediation Levels (SRLs), if established and/or minimum detection levels. Laboratory analytical results of the samples collected from boring B2 were below the applicable regulatory standards with the exception of the soil sample collected from boring B2 at 28 feet bgs (B2-28). Laboratory analytical results of the soil sample collected from boring B2 at 28 feet bgs exceeded the ADEQ Residential SRLs 1,2,4-Trimethylbenzene (TBM), 1,3,5-TMB and tetraethyl lead (TEL). However, it is notable that this sample was collected near the groundwater interface and groundwater conditions at the site are still impacted by a prior release (LUST Case File No. 0322.01). It is also notable that the portable photoionization detector (PID) readings of soil sample headspace is relatively low until they encounter the capillary fringe depths. Additionally, a review of the 2019 and 2020 tank tightness testing documentation indicates the tanks and lines passed monthly and annual testing and are deemed to be competent. For these reasons, ADEQ determined on December 3, 2020 that the suspected release was not a new release.

A follow up soil vapor sampling event was conducted on January 14, 2021 at 4 locations surrounding the SVS-3 location (SVS-4 thru SVS-7). Sample results from the second event reported VOC concentrations at significantly lower values. The elevated vapor concentrations from sample SVS-3 are considered to be a discontinuous anomaly, and not representative of the Site. Analytical results for the 6 sample locations, other than SVS-3, report a maximum benzene concentration of 4.1 parts per billion by volume (ppbv). Using the Johnson & Ettinger (J&E) vapor intrusion risk model, Brown and Caldwell modeled the maximum detected concentration for each VOC that had concentrations greater than the Environmental Protection Agency's (USEPA) Regional Screening Levels (RSLs). The results of the risk analysis indicate carcinogenic and non-carcinogenic risk values of 6.72x10<sup>-8</sup> and 5.45x10<sup>-2</sup> (0.0545) which are below the risk thresholds of 1x10<sup>-6</sup> and 1.0, respectively.

#### Requirements of A.R.S. $\S49-1005(D)$ and (E):

The results of the corrective action completed at the site assure protection of public health, welfare and the environment, to the extent practicable, and clean-up activities completed at this site allow for the maximum beneficial use of the site, while being reasonable, necessary and cost effective.

Other information that is pertinent to the LUST case closure approval: The facility and LUST files were reviewed for information regarding prior cleanup activities,

prior site uses and operational history of the UST system prior to removal.



#### **Groundwater tables:**

KW-5 (upgradient of source well)

Total Depth: 40 feet bgs Screened Interval: 15 – 40 feet bgs

Date	Benzene AWQS is 5 μg/L	1,2-Dibromoethane (EDB) AWQS is 0.05 µg/L*	1,2-Dichloroethane (DCA) AWQS is 5 µg/L	Depth to Water (feet)
October 1990	59	Not analyzed	Not analyzed	25.56
December 1996	240	Not analyzed	Not analyzed	26.71
		SVE began December 19	998	
July 1999	18	Not analyzed	Not analyzed	27.45
October 2000	8.40	Not analyzed	< 0.5	27.96
January 2001	0.58	< 0.50	14	27.24
		SVE ended March 200	2	
July 2002	< 0.5	< 0.5	< 0.5	28.13
April 2005	< 0.5	< 0.5	< 0.5	28.64
March 2006	< 4.0	< 4.0	< 4.0	29.29
April 2008 to present	Dry	Dry	Dry	Dry

KW-2 (cross gradient of source well)

Total Depth: 51 feet bgs Screened Interval: 20 - 51 feet bgs

	Benzene	1,2-Dibromoethane	1,2-Dichloroethane	Free	Depth to
Date	AWQS is 5	(EDB) AWQS is	(DCA) AWQS is 5	Product	Water (feet)
	μg/L	0.05 μg/L*	μg/L	(feet)	water (reet)
June 1988	170	Not analyzed	Not analyzed	0.00	Not reported
January 1991	2,700	Not analyzed	Not analyzed	0.00	25.39
December 1996	Not analyzed	Not analyzed	Not analyzed	0.54	27.00
SVE began December 1998					
July 1999	2,800	Not analyzed	Not analyzed	0.01	27.34
January 2001	y 2001 0.51 < 0.5		0.58	0.00	27.44
		SVE ended M	Tarch 2002		
July 2002	3.1	< 0.5	1.1	0.00	28.04
March 2006	< 4	< 4	< 4	0.00	29.26
September 2011	<1.0	<1.0	<1.0	0.00	30.87
September 2019	< 0.331	< 0.381	< 0.361	0.00	32.66
December 2019	< 0.331	< 0.381	< 0.361	0.00	32.48
April 2021	< 0.0941	< 0.126	< 0.0819	0.00	32.69



KW-3 (source well)

Total Depth: 49 feet bgs Screened Interval: 19 - 49 feet bgs

Date	Date AWQS is 5 (EDB) AWQS is μg/L 0.05 μg/L		1,2-Dichloroethane (DCA) AWQS is 5 µg/L	Free Product (feet)	Depth to Water (feet)
June 1988	2,400	Not analyzed	Not analyzed	0	Not reported
January 1991	7,500	Not analyzed	Not analyzed	0	25.50
		SVE began Dec	cember 1998		
July 1999	Not analyzed	Not analyzed	Not analyzed	1.36	28.34
July 2001	350	Not analyzed	75	0.00	27.50
		SVE ended M	Iarch 2002		
January 2002	2,600	7.3	220	0.00	27.64
July 2002	Not analyzed	Not analyzed	Not analyzed	1.08	28.80
March 2006	Not analyzed	Not analyzed	Not analyzed	0.76	29.60
September 2011	< 10	< 10	< 10	0.00	30.79
September 2019	7.04	< 1.90	6.19	0.00	32.55
December 2019	< 33.1	< 38.1	< 36.1	0.07	32.62
April 2021	< 9.41	< 12.6	< 8.19	0.30	32.59

KW-1 (cross gradient well)

Total Depth: 48.5 feet bgs Screened Interval: 18.5 – 48.5 feet bgs

Date	Benzene AWQS is 5 μg/L 1,2-Dibromoethane (EDB) AWQS is 0.05 μg/L*		1,2-Dichloroethane (DCA) AWQS is 5 µg/L	Free Product (feet)	Depth to Water (feet)
June 1988	1,000	Not analyzed	Not analyzed	0.00	Not reported
January 1991	6,700	Not analyzed	Not analyzed	0.00	24.97
December 1996	3,000	Not analyzed	Not analyzed	0.00	26.17
SVE began December 1998					
July 1999	Not analyzed	Not analyzed	Not analyzed	0.62	27.42
July 2001	Not analyzed	Not analyzed	Not analyzed	0.04	27.22
		SVE ended M	arch 2002		
January 2002	Not analyzed	Not analyzed	Not analyzed	0.03	27.36
April 2008	< 1	< 1	Not analyzed	0.00	29.76
September 2011	< 1	< 1	< 1	0.00	30.48
September 2019	< 0.331	< 0.381	< 0.361	0.00	32.27
December 2019	< 0.331	< 0.381	< 0.361	0.00	32.07
April 2021	< 0.0941	< 0.126	< 0.0819	0.00	32.26



### KW-4 (cross gradient well)

Total Depth: 40 feet bgs Screened Interval: 15 – 40 feet bgs

Date	Benzene AWQS is 5 µg/L	1,2-Dibromoethane (EDB) AWQS is 0.05 µg/L	1,2-Dichloroethane (DCA) AWQS is 5 µg/L	Free Product (feet)	Depth to Water (feet)
October 1990	19,000	Not analyzed	Not analyzed	0.00	25.77
May 1991	8,800	Not analyzed	Not analyzed	0.00	25.73
December 1996	12,000	Not analyzed	490	0.00	26.94
		SVE began Dec	cember 1998		
July 1999	Not analyzed	Not analyzed	Not analyzed	0.79	28.29
July 2001	2,700	Not analyzed	550	0.00	27.92
		SVE ended M	Iarch 2002		
July 2002	Not analyzed	Not analyzed	Not analyzed	0.79	28.98
April 2008	Not analyzed	Not analyzed	Not analyzed	1.60	31.75
March 2010	250	Not analyzed	150	0.49	31.39
September 2011	< 20	< 20	42	0.18	31.43
September 2019	6.73	< 3.81	< 3.61	0.00	32.98
December 2019	5.32	< 3.81	< 3.61	0.00	32.79
April 2021	2.28	< 2.52	3.40	0.00	32.79

### KW-6 (downgradient well)

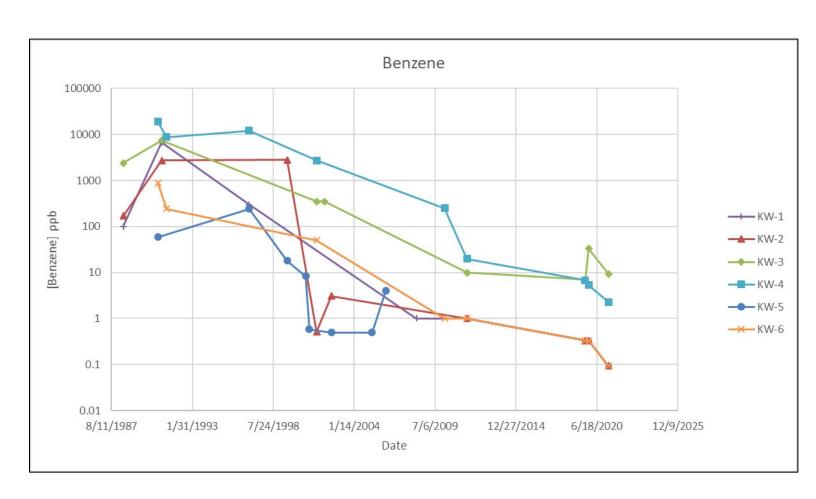
Total Depth: 40 feet bgs Screened Interval: 15 - 40 feet bgs

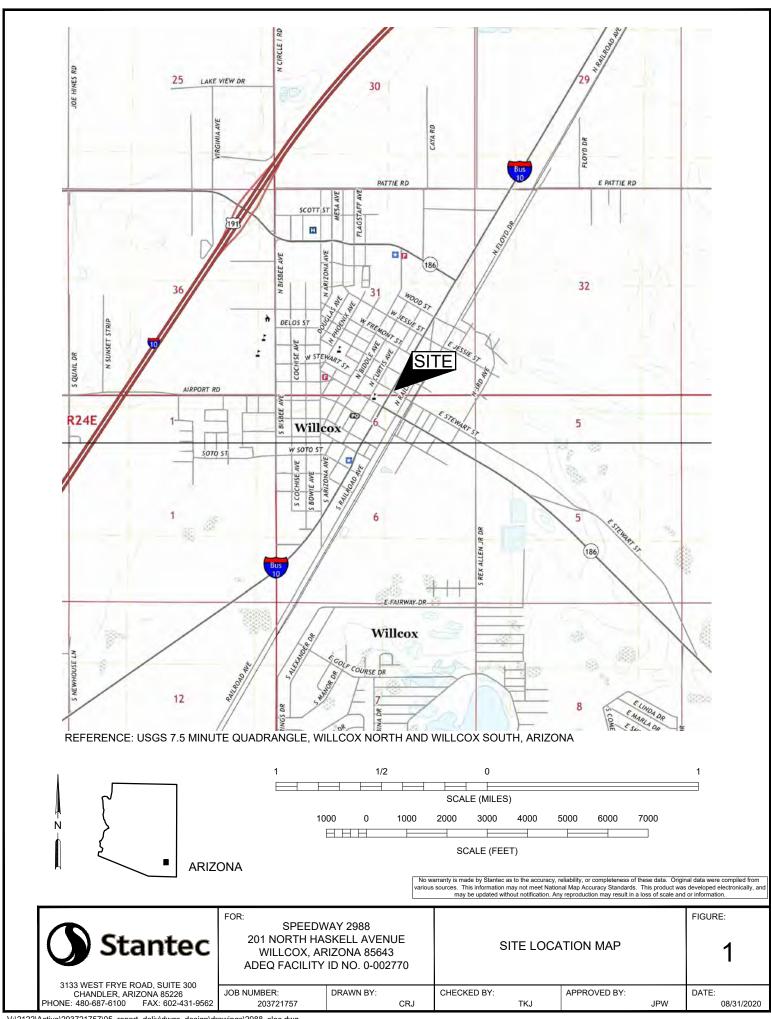
Date  Benzene AWQS is 5 μg/L  1,2-Dibromoethane (EDB) AWQS is 0.05 μg/L*			1,2-Dichloroethane (DCA) AWQS is 5 µg/L	Free Product (feet)	Depth to Water (feet)
October 1990	890	Not analyzed	Not analyzed	0.00	25.84
May 1991	240	Not analyzed	Not analyzed	0.00	25.81
December 1996	Not analyzed	Not analyzed	Not analyzed	1.39	28.04
	•	SVE began Dec	ember 1998		
July 1999	Not analyzed	Not analyzed	Not analyzed	1.57	29.03
July 2001	50	Not analyzed	110	0.00	28.08
		SVE ended M	Tarch 2002		
January 2002	Not analyzed	Not analyzed	Not analyzed	0.66	28.70
April 2005	Not analyzed	Not analyzed	Not analyzed	1.31	30.05
March 2010	< 1	< 1	14	0.00	31.08
September 2011	< 1	< 1	< 1	0.00	31.30
September 2019	< 0.331	< 0.381	< 0.361	0.00	33.09
December 2019	< 0.331	< 0.381	< 0.361	0.00	32.91
April 2021	< 0.0941	< 0.126	< 0.0819	0.00	32.11

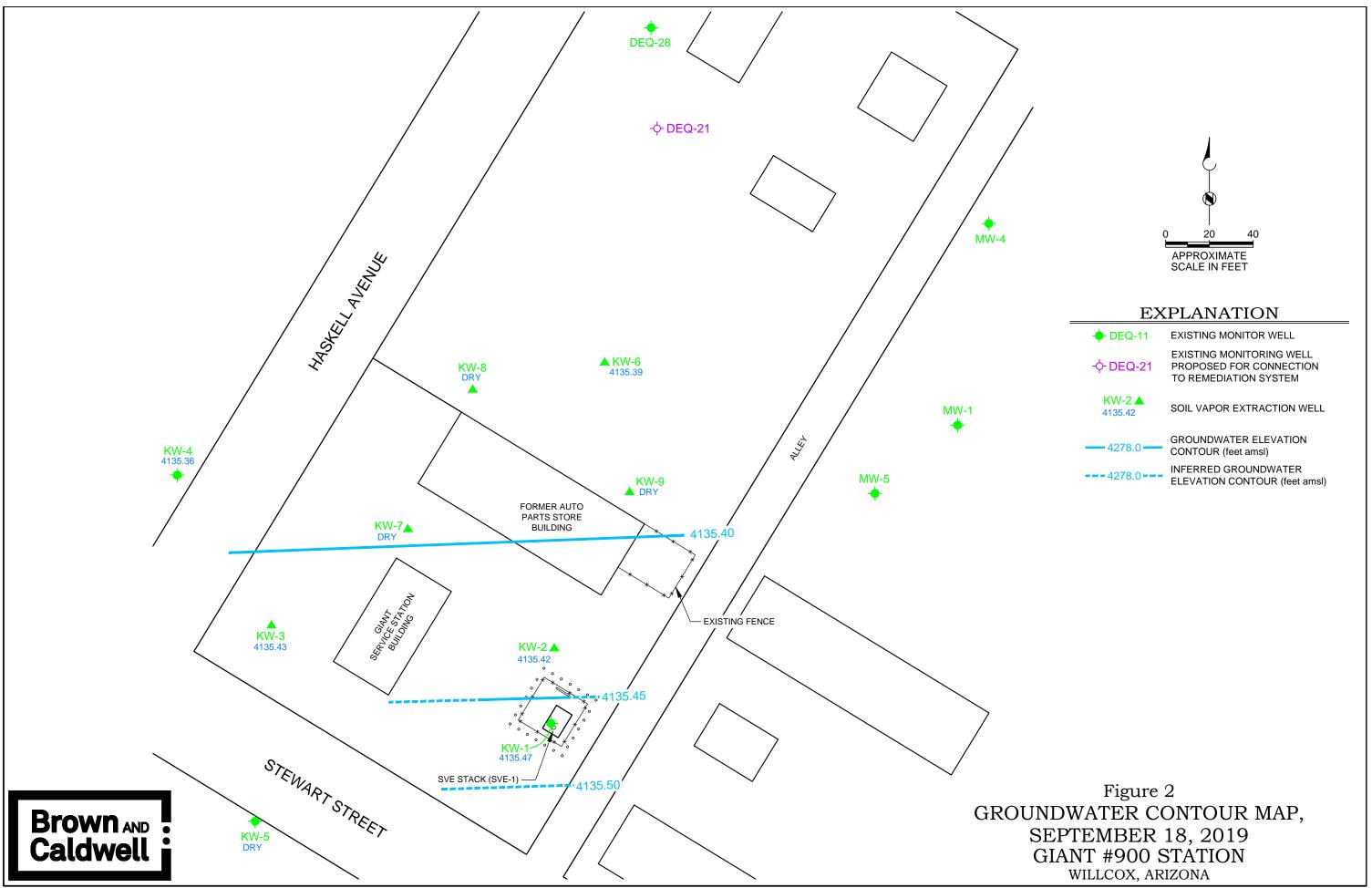
<sup>\*</sup>The concentration of EDB is not reported over the laboratory method detection level, which exceeds the AWQS. EDB is not usually present in a sample without other VOCs exceeding an AWQS.

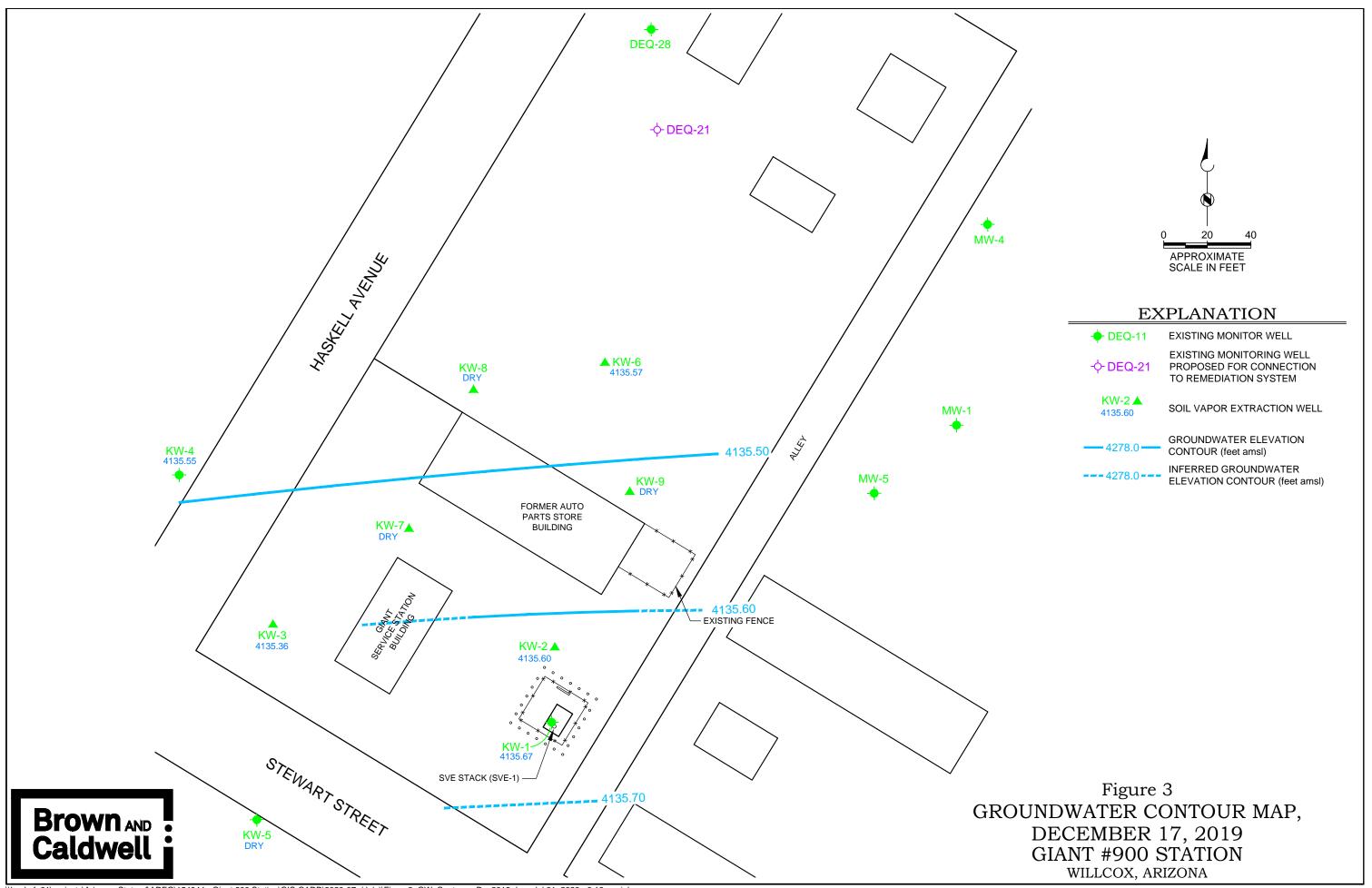


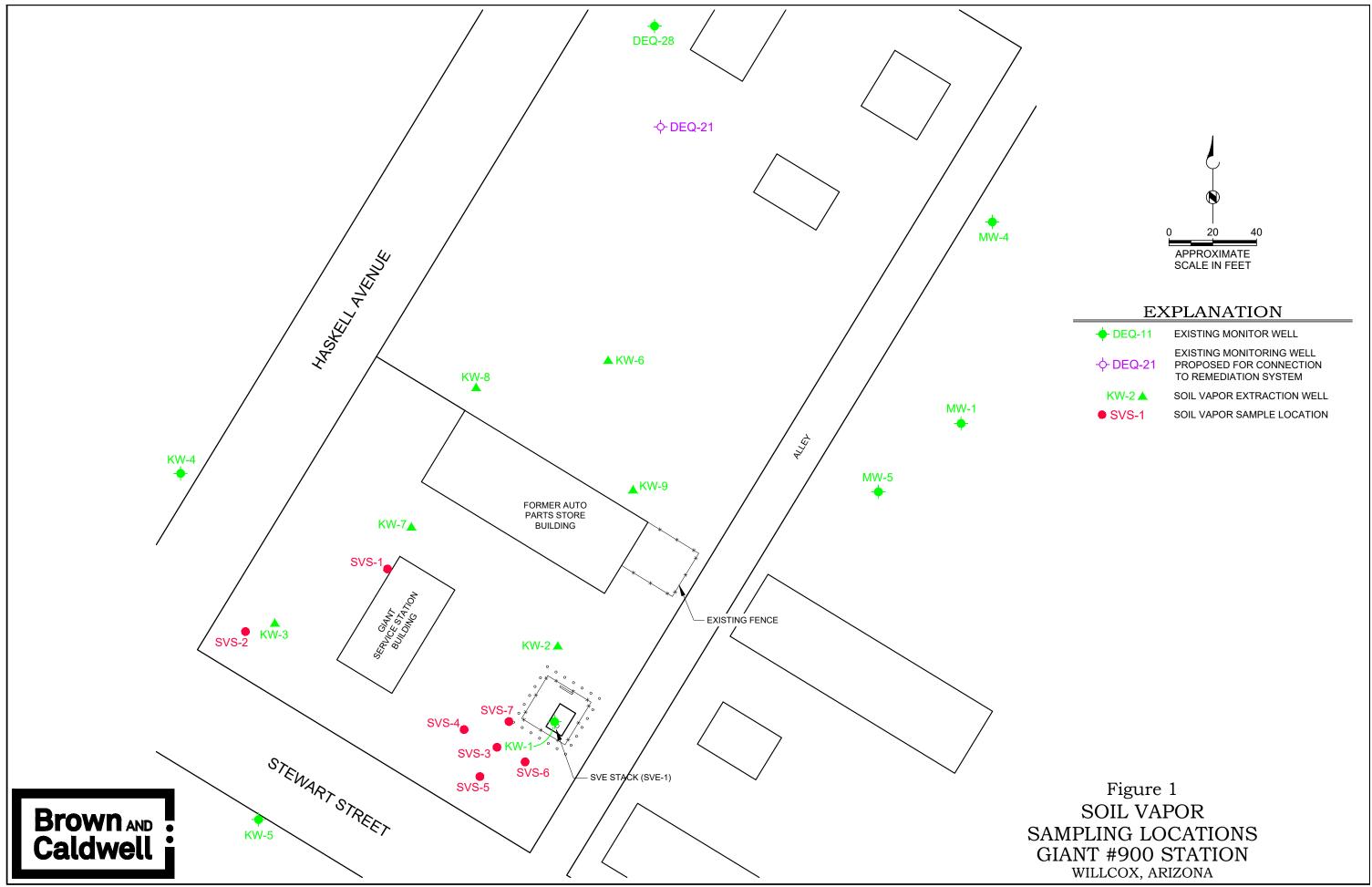
	rd					
		MNA Parameters (mg/L)				
				Nitrate as N		
WellID	Date Sampled	Ferrous Iron	Manganese	(EPA 9056A)	Sulfate	Methane
KW-1	12/17/2019	<0.015	0.0238	9.67	247	<0.00291
KW-1	4/14/2021	<0.150	0.0308	7.79	189	<0.00291
KW-2 12/17/2	12/17/2019	0.035 J	0.0068 J	7.55	180	<0.00291
KW-Z	4/14/2021	<0.015	0.00667 J	6.89	177	<0.00291
KW-3	12/17/2019	2.9	0.199	<0.0227J	16	0.597
KW-5	4/14/2021	2.15	0.133	0.206	10.8	0.415
KW-4	12/17/2019	32.5	0.484	0.501	10.2	1.1
KW-4	4/14/2021	9.54	0.567	1.81	22.8	1.08
KW-6	12/17/2019	0.079	0.104	<0.0227J	80	<0.00291J
	4/14/2021	<0.015	0.0339	0.565	78.90	<0.00291
Notes:						
mg/L = milligra	ms per liter					

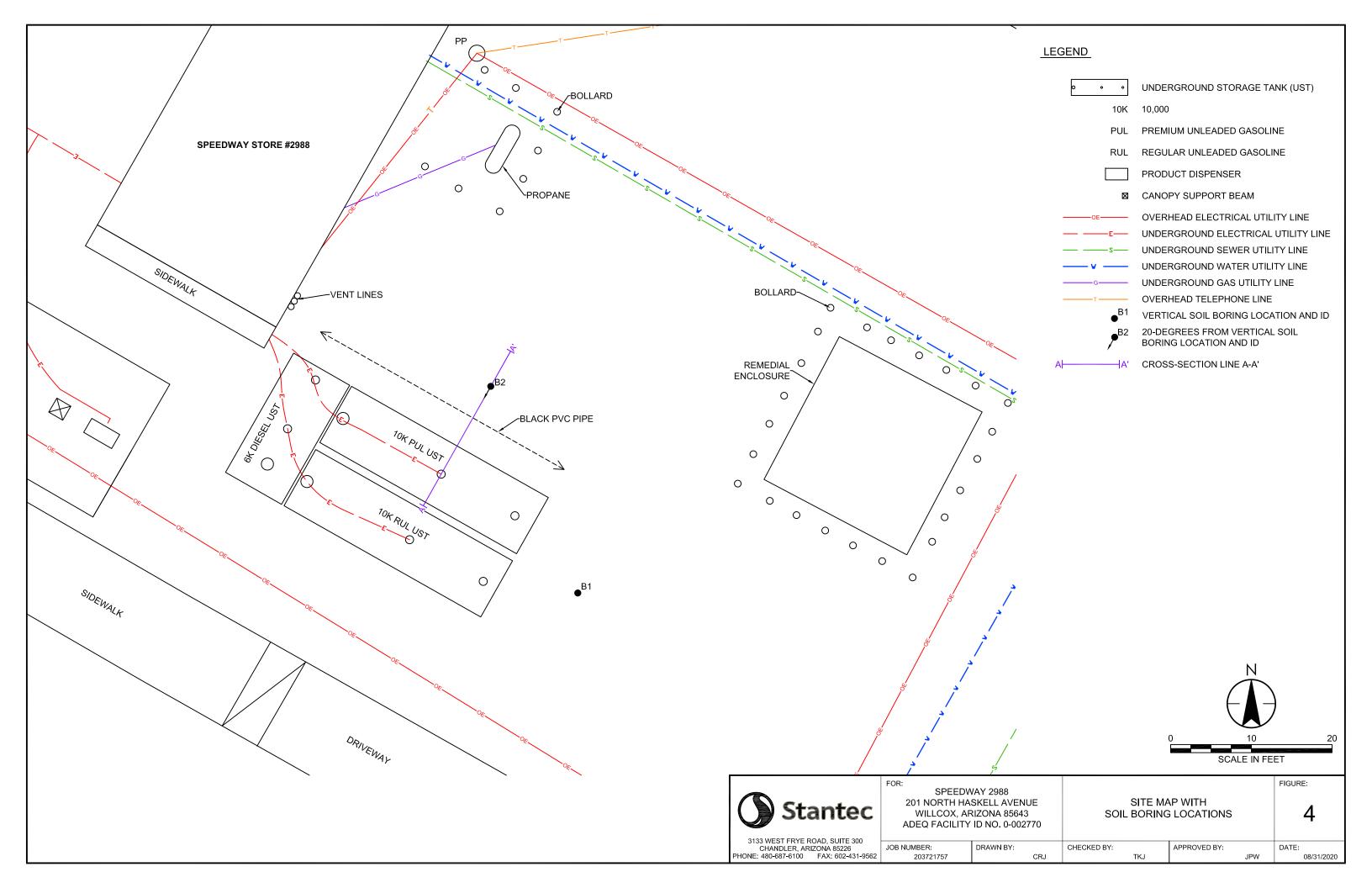


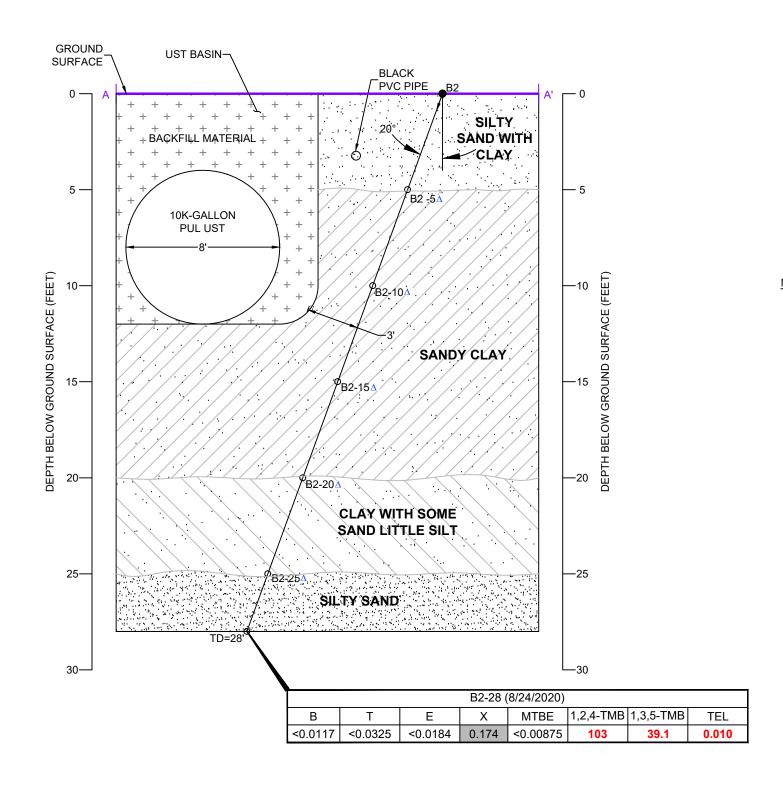












#### LEGEND

UST UNDERGROUND STORAGE TANK

10K 10,000

PUL PREMIUM UNLEADED GASOLINE

20-DEGREE FROM VERTICAL SOIL BORING LOCATION AND ID

TD TOTAL DEPTH OF BORING

A' CROSS SECTION A-A'

●B2-25 SOIL SAMPLE LOCATION AND ID

△ LABORATORY ANALYTICAL RESULTS BELOW THE ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY RESIDENTIAL AND/OR NON-RESIDENTIAL SOIL REMEDIATION LEVELS

WELL ID (SAMPLE DATE)							
В	Т	Е	х	MTBE	1,2,4-TMB	1,3,5-TMB	TEL
#	#	#	#	#	#	#	#

NOTE: CONCENTRATIONS DISPLAYED IN MILLIGRAMS PER KILLOGRAM (mg/kg)

SAMPLE DEPTH VERTICAL SAMPLE DEPTH IN FEET

B BENZENE

T TOLUENE

E ETHYLBENZENE

X TOTAL XYLENES

MTBE METHYL TERT BUTYL ETHER

1,2,4-TMB 1,2,4-TRIMETHYLBENZENE

1,3,5-TMB 1,3,5-TRIMETHYLBENZENE

TEL TETRAETHYL LEAD

< 0.119 COMPOUND NOT DETECTED AT OR ABOVE LABORATORY

**DETECTION LIMIT** 

**BOLD & RED** CONCENTRATION DETECTED EXCEEDS ADEQ RESIDENTIAL

CONCENTRATION DETECTED IS ABOVE THE LABORATORY REPORTING LIMIT, BUT BELOW THE ADEQ RESIDENTIAL

AND/OR NON-RESIDENTIAL SRLs

CONCENTRATION ESTIMATED. ANALYTE WAS DETECTED BELOW LABORATORY MINIMUM REPORTING LEVEL (MRL) BUT

ABOVE THE METHOD DETECTION LIMIT (MDL)

ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY

SOIL REMEDIATION LEVELS





	FOR:
Stantec	201 NC WILL ADEQ F
FRYE ROAD, SUITE 300 LER, ARIZONA 85226	JOB NUMBER:

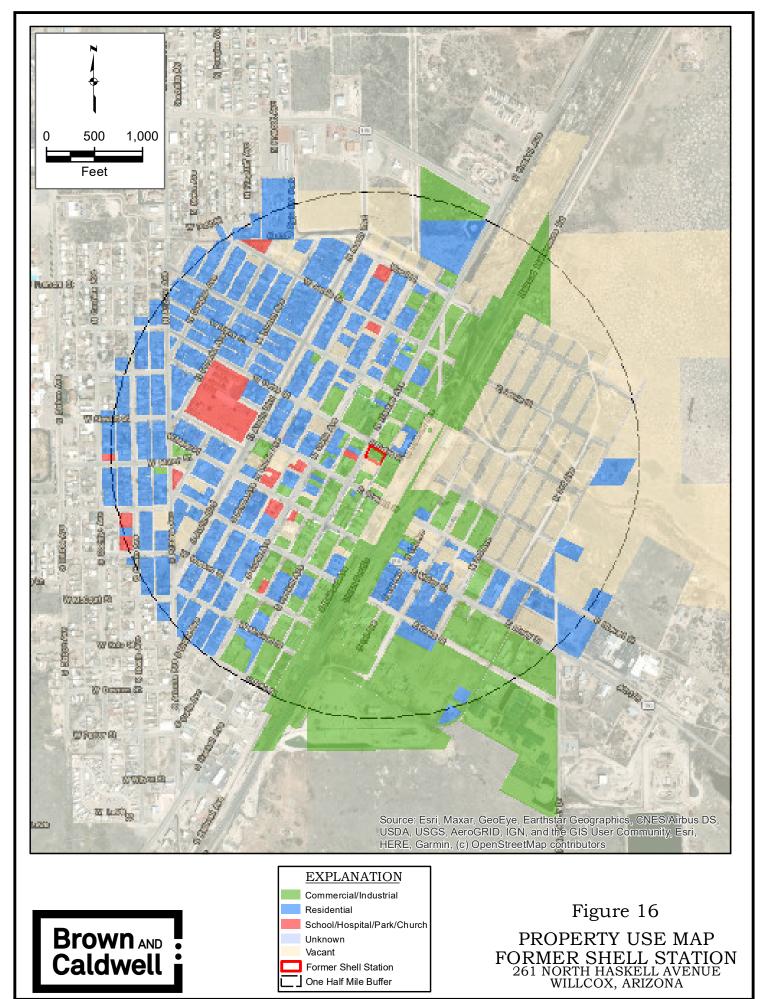
OR:	
	SPEEDWAY 2988
	201 NORTH HASKELL AVENUE
	WILLCOX, ARIZONA 85643
,	ADEQ FACILITY ID NO. 0-002770

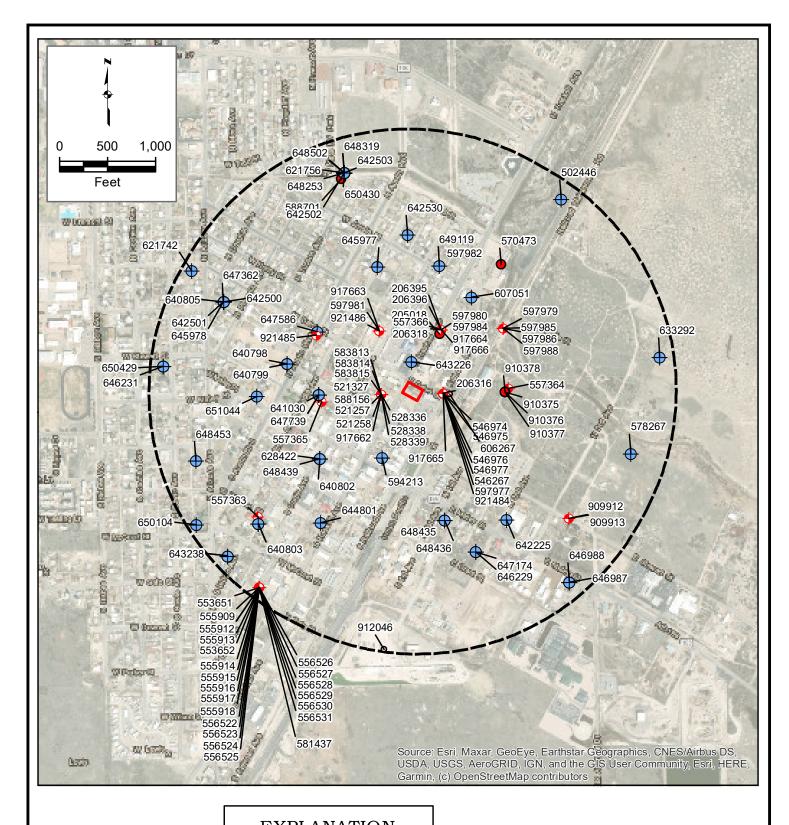
CROSS-SECTION A-A'	

	5
DATE:	

FIGURE:

DRAWN BY: CHECKED BY: APPROVED BY: 203721757 CR.I TK.I .IPW 09/06/2020







## 

## Figure 15 REGISTERED WELLS WITHIN ONE HALF MILE FORMER SHELL STATION

261 NORTH HASKELL AVENUE WILLCOX, ARIZONA